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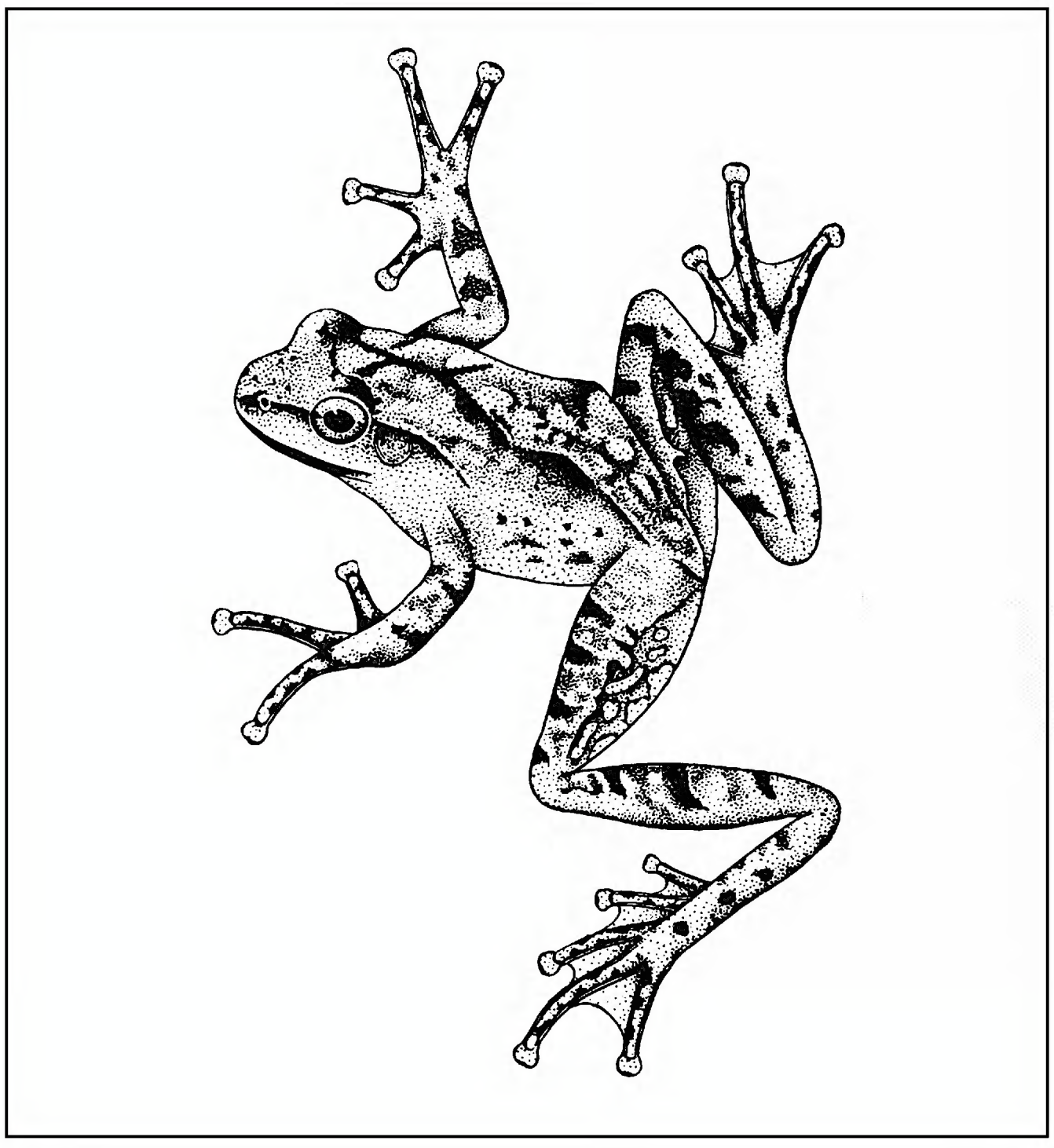

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A Review of: Willson, J. D., M. E. Dorcas and R. W. Snow. 2010. *Identifying Plausible Scenarios for the Establishment of Invasive Burmese Pythons (*Python molurus*) in Southern Florida*. Biological Invasions. Online doi 10.1007/s10530-010-9908-3 . . . . . David G. Barker and Tracy M. Barker 41

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First impressions are important. This particular paper is an excellent example of just that. We call attention to the word "plausible" in the title. According to *Webster's New Universal Unabridged Dictionary* (1996), the chief synonym of "plausible" is "specious" and thesewords "describe that which has the appearance of truth but might be deceptive." It goes on to define a plausible argument as "one that cannot be verified or believed in entirely." The *American Heritage Dictionary* (1982) defines plausible as "Giving a deceptive impression of truth, acceptability or reliability." It also provides "specious" as both a definition and a synonym.

Okay, the point is only semantic and more humorous than critical. However, to further color the first impression of the paper, the taxon that is the focus of this paper is incorrectly identified in the title. Yes, this is yet another paper published by *Biological Invasions* where the authors and the editor fail to use the correct scientific name for the animal they purport to study. Invasive snake biologists studying Burmese pythons apparently feel it important to embrace the dated and incorrect taxonomy that has plagued and continues to plague their papers. This is a fairly common problem of environmental papers, and one with potentially serious consequences (Bortolus, 2008). It's pretty pitiful when the researchers can't correctly identify the species they study.

However, they have a problem, because to correctly identify *Python bivittatus* would be a tacit admission of a fundamental error made by Rodda et al. (2008) and Reed and Rodda (2008/2009), an error that invalidates all of the climate match analyses that have been published for the Burmese python (Barker and Barker, 2008a). That, in turn, collapses the house of cards that has been constructed with research, grants, publications, and, importantly, media attention, all based on the fallacious original studies. Incorrect taxonomy is only one of many fundamental errors in Reed and Rodda (2008/2009) that invalidate the analyses and conclusions for all the species in that report (see Barker and Barker, 2010a, b, c).

We did not hold much hope for this paper just based on its title and, unfortunately, reading the paper did little to change our first impression. However, the paper is important in that it is yet one more attempt to make keepers responsible for the presence of Burmese pythons in the Everglades National Park [ENP]. This paper appears to be another part of a game plan that the invasive biologists are closely following in order to reap millions of taxpayer dollars from Burmese python studies.

We offer the following summary to readers not familiar with this paper: in the Introduction the authors yet again cite the overused and unproven statement of Pimental et al. (2000) that invasive species are the bane of all ecosystems, the greatest threat to global biodiversity. They then move on to the example of the insidious little brown treesnake in Guam, and point out how much vital information has been learned from that fiasco that can now be applied to the Burmese python problem. [In fact, we contend that what government biologists learned from the brown treesnake boondoggle was how to get more than $100 million from taxpayers for a completely unsuccessful program that failed in every aspect except that, so far, the treesnakes haven't made it to Hawaii.] The authors then go on to state that is it critical to understand just how the Burmese pythons got loose in the first place [more on that later] and so this study is necessary.

In the Methods section they use a simple mathematical formula to estimate the growth of the python populations in order to then extrapolate backwards and identify the time of the original introduction of the founder pythons, and the characteristics of the founders (was it many young snakes, a few young snakes, many adult snakes, or a few adult snakes?) They then plug in various values for the variables in their model, generate some very scientific-looking graphs, and come up with six plausible scenarios for the introduction and establishment of the reproducing Burmese python population in south Florida.

In the Discussion section, the authors carefully evaluate each of their plausible explanations, until finally they state " . . . we consider the most plausible scenario for establishment of pythons in the region to have been a one-time release of a relatively small number of adult or juvenile *pet pythons* in the mangrove regions of ENP near Flamingo prior to 1985." [italics ours]. We wonder, would it make a difference if they were *research pythons* from a laboratory, *rescue pythons* from Animal Control, or *education pythons* from the Living Materials Center of a school system? Can the authors prove these animals were "pets"? If not, why have they so unsubtly and specifically identified the pythons as pets? There are many reasons why people keep animals other than as "pets."

The paper goes on to state that " . . . proactive measures that prevent initial introductions *may* be more effective than reactive control or eradication measures once successful establishment (reproduction) is detected." [italics ours].

It's carefully worded, but the unwritten conclusion, and in our opinion, the authors' primary intent for the article, is to endorse the proposed action of the U.S. Fish and Wildlife Service to list the nine constricting snakes on the Injurious Wildlife List of the Lacey Act. That is the only ongoing "proactive measure" that has been proposed or is underway to being enacted at the federal level.

We do not consider this to be some spectacular revelation. This paper amounts to no more than simplistic reasoning that if there were no pythons in captivity, then they couldn't escape into the ENP. This line of thought, extended into modern society is the same as stating that if we had no motorcycles, there would be no motorcycle accidents; if we didn't have swimming pools, then people couldn't drown in them; if we didn't have jungle gyms, kids couldn't fall off of them; if no American citizen had animals, then animal cruelty in our country would stop.

Before we review this article further, we want to digress and discuss from where this article came. There is a group of government biologists that have come together to work on the "invasive constrictor" problem. The core group is made up of government employees working for the U.S. Geological Survey, the U.S. Fish and Wildlife Service and the National Park Service. There are ancillary researchers working with the group who are not government employees. Some are university researchers; some are independent but contracted and funded by the government agencies. These researchers have titled their working group the Giant Constrictor Risk Assessment Partnership. Now the acronym for that group, as hard as it is to believe, is Giant CRAP. The taxpayers are funding a bunch of biologists with an inappropriate sense of scatological humor—it's not funny that the action they support will destroy thousands of small businesses and could make as many as a million American owners of boas and python into potential felons. Just how serious is this research that comes from Giant CRAP?

Ken Salazar, the Secretary of the Department of the Interior presented the "Partners in Conservation Award," the most prestigious award given by the DOI, to the government biologists in Giant CRAP. We wonder—did he know he was giving his highest award to Giant CRAP?

GCRAP has published online its template and game plan for future studies of Burmese pythons. GCRAP biologists know that there is potentially huge funding for research for Burmese python studies in Florida. However, the first step toward reaping the millions of dollars they see on the horizon is to get the Burmese python and as many as possible other boas and pythons on the Injurious Wildlife List. They are using what they learned from the brown treesnake project and number one on the list is that the big bucks come when the Burmese python receives its federal and formal status as "injurious wildlife."

We note the following statement on the website of the North American Brown Treesnake Control Team: "The government biologists have published a comprehensive book and more than 100 papers, reports, and other products on the BTS and related topics." That means that American taxpayers spent about a million dollars per publication—this is good news? This is the GCRAP plan for Burmese pythons and as many other large constrictors species as possible.

The USGS Technical Announcement released 14 October 2010 is a news release about GCRAP receiving the award from Salazar; it states that GCRAP "issued a risk assessment, paving the way for the proposal to list the Burmese python and eight other large constrictor snakes as "injurious wildlife."

One of the authors of this article in review, R. L. "Skip" Snow, is a GCRAP biologist and a recipient of the DOI award. It follows that this article has a supporting function in enacting the plans of the group.

As has been true for all of the GCRAP articles we have reviewed, there are so many problems with this paper that it would be very lengthy and tedious to detail them all. Here follows what we feel are the worst problems of this paper.

Every variable used in the mathematical formula is an estimate. That means that, at best, every "scientific-looking" graph is no more than the authors' most "plausible" guess, and it equally allows that they could be purposefully specious. Why try to quantify, even simply, such a complex problem long before the data exists on which to base a calculation? In the words of the authors: " . . . the exact circumstances that lead to introduction and establishment of Burmese pythons in Florida will never be proven."

We think T. H. Huxley aptly summed up this problem in a speech he gave in 1869, intended as a criticism of Lord Kelvin's mathematical calculations of the age of the sun and earth (Kelvin declared they were about 100 million years old.) Huxley stated "This seems to be one of the many cases in which the admitted accuracy of mathematical processes is allowed to throw a wholly inadmissible appearance of authority over the results obtained by them… As the grandest mill in the world will not extract wheat flour from peascods, so pages of formulas will not get a definite result out of loose data."

The underlying central problem with this paper is that it is a premature extrapolation of a mathematical treatment of a biological problem. Hard data necessary to correctly analyze this situation simply do not exist. However, these authors go even further.

After making their premature estimations of population and population growth, they then glean through the six hypothesized possibilities of how the population grew and discard all that do not fit their best estimation of where the population started. They declare that this "nexus" is the mangrove area in the south area of ENP between Flamingo and West Lake.

The fact is that if a nexus even does exist, its location is not known with certainty, and there is no way short of a crystal ball to determine if the current nexus of the population is also where the species first established. Almost all samples of pythons in the ENP are taken from on roads or near to roads, and most of the territory of the ENP is unsampled. Nobody knows what is going on out there in the park.

The authors reject out of hand that Hurricane Andrew was responsible for the release of the founding population, as has been discussed elsewhere (Barker and Barker, 2008b). They state: " . . . the spatial and demographic patterns of python captures are not consistent with such scenarios [referring to Hurricane Andrew]. The nexus of python encounters in the region and the location where wild reproduction was first confirmed, is the mangrove forests and saline glades of the southern portion of ENP, located at least 30 km from the nearest reptile breeder/importers. Thus, in order for the python population in southern Florida to have originated from destruction of breeder/importer facilities, large numbers of pythons would have had to move over 30 km. . . . "

Apparently the authors do not understand that when the center of a hurricane like Andrew hits a building and destroys it, as it did the Quonset hut of a python importer in Homestead, that the destroyed building and its contents (900 Burmese pythons temporarily caged individually in lightweight delicatessen cups) would be blown to the south.

This is the exact scenario caused by Hurricane Andrew. As illustrated in Figure 1, Hurricane Andrew came straight into Homestead on a westward path. The direction of the wind would have been straight south in Homestead until the eye passed over.

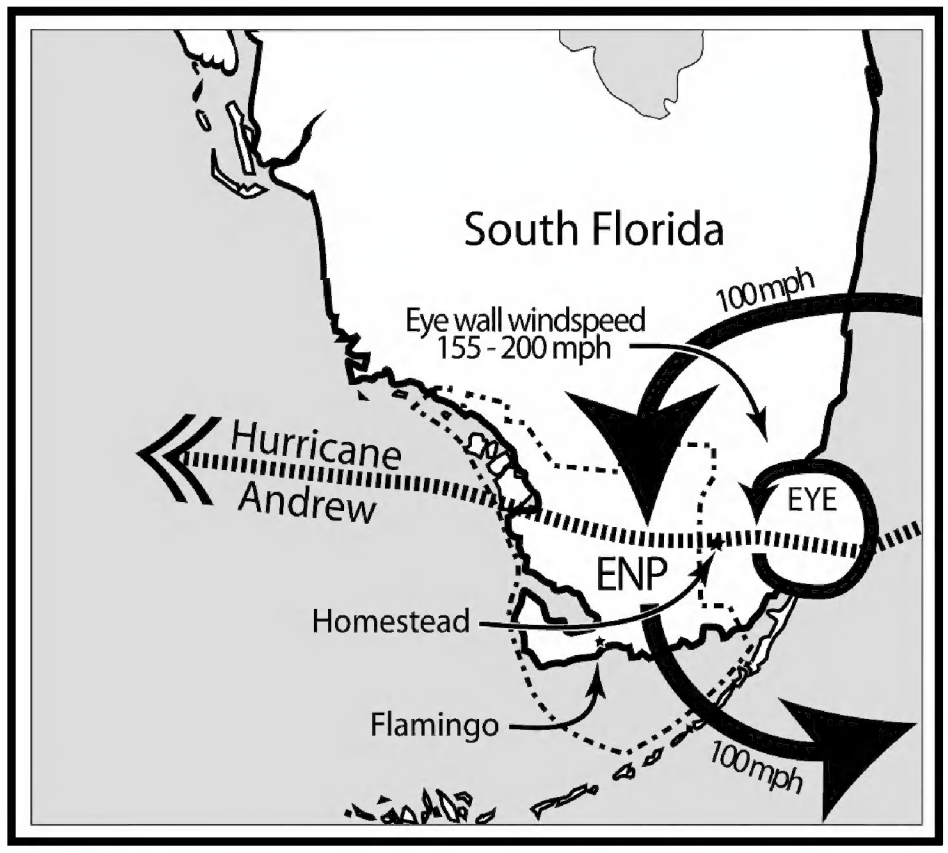

Figure 1.

Detritus picked up in Homestead would have been blown directly toward the hypothetical "nexus" of the authors. The wind speed of the eye wall of Andrew was in excess of 300 km/hr when it hit Homestead. At that velocity, it would take a little python in a delicatessen cup about 5 to 6 minutes to arrive in Flamingo.

This natural disaster could have delivered as many as 900 Burmese pythons into the mangrove forests in southern ENP in maybe 10 or 15 minutes even if they were moving in slower lead winds with a velocity of 160 km/hr. They might have been all together, still in the shell of the building. That seems to be a far more parsimonious, logical and likely explanation of how the founders arrived at the nexus, wherever it is, than the conjecture posed in this paper that an irresponsible keeper or several keepers waded out into an inaccessible mangrove swamp within a short time period prior to 1985, and released a "relatively small number" of unwanted pet pythons.

In fact, we do not believe that it is necessary for us to explain to Florida researchers how hurricane winds blow. Rather, it seems far more likely that the point of this paper is to lay the blame of the escaped/released founding pythons at the feet of herpetoculturists. It seems to us that the authors of the paper elected to ignore that the most likely scenario was that it was a natural disaster responsible for the founding population of Burmese pythons in the park. Indeed, if their location of the nexus of the population is actually correct, an inhospitable swamp away from roads, then the hurricane scenario becomes all the more likely.

So why have the authors discounted Hurricane Andrew? Like the tsunami in Japan, even when well prepared, some natural disasters just can't be stopped. The authors of this paper can't and haven't proven that keepers of pythons are responsible for the ENP pythons. But assigning blame is one way to deflect the criticisms that the proposal to list the constricting snakes on the Injurious Wildlife List is an ineffective knee-jerk reaction to the problem that will have no effect other than to significantly increase available government grants, taxpayer dollars, for GCRAP.

The conclusion the authors have drawn in this paper, derived from the mathematical treatment of estimation and supposition, is that it is statistically likely that keepers were responsible for pythons in the ENP. That, in turn, neatly supports GCRAP's goal of getting those constrictors listed on the Injurious Wildlife List.

Mark Twain said it best: "there are three types of lies—lies, damned lies, and statistics."

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Notes on the Distribution of *Pseudotriton montanus* in Maryland

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The mud salamander, *Pseudotriton montanus*, was first reported from Maryland by Fowler (1941) based on several localities dating from 1936–1940. This species is confined almost exclusively to the Coastal Plain Physiographic Province in the state (Cooper, 1960; Harris, 1975; Martof, 1975; Conant and Collins, 1991; Petranka, 1998; Hunsinger, 2005). A few reports exist from the adjacent piedmont. Aside from Fowler's original article and his (1946) description of the eggs of *P. montanus*, little has been published on this species in Maryland; however, much of this is erroneous or unfounded. Museum abbreviations refer to the following collections: BYU (Brigham Young University), CM (Carnegie Museum of Natural History), CU (Cornell University), FMNH (Field Museum of Natural History), KU (University of Kansas), LACM (Natural History Museum of Los Angeles County), MSB (Museum of Southwestern Biology, University of New Mexico), NHSM (Natural History Society of Maryland), NHSM/HSH (Natural History Society of Maryland/Herbert S. Harris, Jr.), PSM (James P. Slater Museum, University of Puget Sound), TSU (Towson University), UF (Florida Museum of Natural History, University of Florida), USNM (National Museum of Natural History).

Fowler (1941) stated that he discovered three specimens from Western Run Parkway, Baltimore City, in the Natural History Society of Maryland (NHSM) collection that were misidentified as *P. ruber*. He cited no catalogue numbers, although being a newly formed collection it is possible that this material had not yet been catalogued. Fowler wrote that these specimens were all collected on 12 August 1940. However, there are only two specimens listed in the NHSM files and they were taken on 21 March 1940 (NHSM 1209) and 3 August 1940 (NHSM 1222). Fowler also misstated the data for a specimen formerly in the U.S. Fish and Wildlife Service (USBS) collection from Branchville, Prince George's County. The correct data are USBS 4643 (formerly Francis M. Uhler 1022), now USNM 309555, collected on 26 May 1929. An even earlier specimen, also from Branchville, and the earliest known collection of this species in Maryland, and also one not provided to Fowler by Uhler, is USBS 3876 (formerly FMU 255), taken on 28 August 1926. This specimen is now USNM 309554.

The report of the mud salamander from near Price, Queen Anne's County, by J. A. Fowler (Conant, 1957) appears to be invalid. There is no specimen from this locality in the Carnegie Museum, where Fowler's collection was deposited, and this would not be the only time miscommunication has occurred between Conant and Maryland herpetologists (Miller, 1993). However, Fowler (in Harris, 1969a) did report collecting *P. ruber* near Price on 22 February 1956, although again there is no material present in the Carnegie collection, nor any mention of either species at this locality in Fowler's logbook (S. P. Rogers, personal communication). However, Fowler did collect *P. montanus* in Queen Anne's County, 1.5 mi (2.4 km) NE Wye Mills (Talbot County) on 12 February 1951 (CM 139414). Fowler also collected two larval *P. montanus* from Chapel Branch, near (N) Denton, Caroline County, on 23 February 1952 (CM 139415-139416). An earlier specimen from Caroline County (MSB 28099) was taken on 25 April 1950 from 1.0 mi (1.6 km) E Federalsburg. These are the first documented records for these counties (Harris, 1975).

Three range limit records exist for *P. montanus* in the Maryland piedmont and one for the District of Columbia (physiographic province unknown) that have no support in the literature or in systematic collections. In his distributional matrix, Cooper (1960, 1965) listed the species from the District of Columbia and Montgomery County, but I was unable to learn the sources for these localities. Harris (1969b, 1975) also plotted sites from these jurisdictions, but was unable to account for them (H. S. Harris, Jr., personal communication). Similarly, the basis for another record mapped by Harris (1969b, 1975) that is centered on Loch Raven Reservoir, Baltimore County, is currently unknown (H. S. Harris, Jr., personal communication). A third piedmont locality mapped by Harris (1975), also in Baltimore County and also for which there is no documentation, lies along an unnamed tributary (spring) to the Gunpowder Falls, a short distance (ca. 150 m) downstream from Proctor Lane (B. S. Leverton, personal communication, 1974 or 1975). This is 1.9 km WSW Cub Hill. The overall area, at the time, was degraded due to residential construction and a light commercial operation; trees were few and the vegetation was token. In an attempt to find the species I visited the site twice in 1976 (23 April, 6 May), but without success. Suitable habitat for adults was limited to a tiny muddy seepage, although the stream was still healthy enough to support *P. ruber*. Leverton has been unresponsive to several attempts to learn if documentation (e.g., photographs) or corroboration (e.g., additional testimony) exists for this locality. I take this as evidence that Leverton has lost confidence in his site and, accordingly, do not consider it valid.

Harris et al. (1967), in their list of problems in Maryland herpetology, asked: "Does *Pseudotriton m. montanus* occur in the Piedmont of Maryland. [sic]" Fowler (1941) had long ago recorded its occurrence in the piedmont of Baltimore City. Harris (1966) himself had already noted that, according to J. E. Cooper, the mud salamander occurs "in the Glen Artney [Glenartney] area" of Patapsco State Park (county unstated); this site is also in the piedmont. This claim is probably based on NHSM 231, from Vineyard, Patapsco State Park, Baltimore County, collected on 3 July 1935. There is also a larva (NHSM 253) catalogued as *P. montanus* from near Glenartney, Patapsco State Park, Baltimore County, taken on 9 August 1941; however, this specimen appears to be a misidentified *P. ruber*. At present, there are only two other confirmed records for the mud salamander in the Maryland piedmont: one is CM 139401 from Moore's Branch, Baltimore County (date of collection stated as

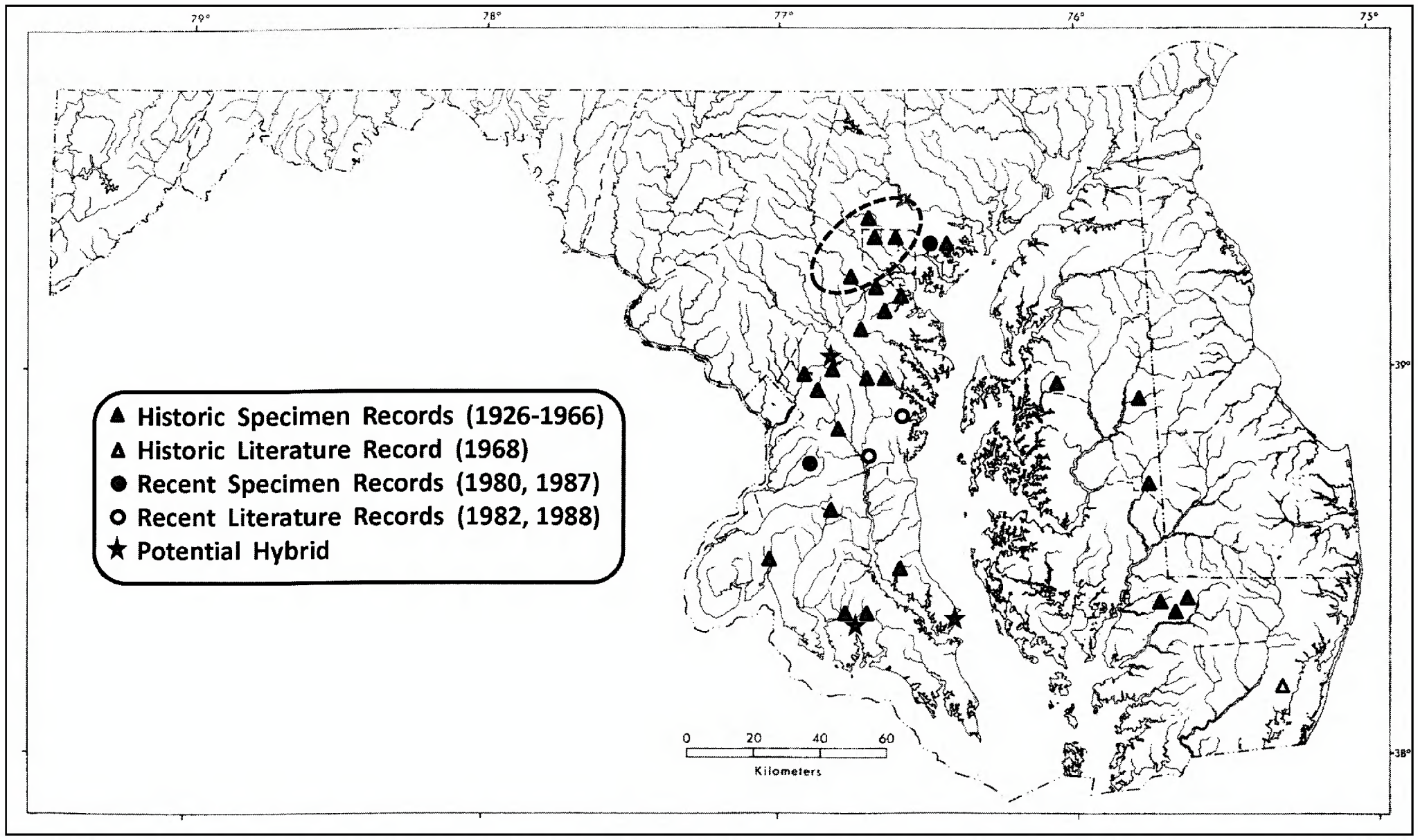

Figure 1. Map of Maryland, Delaware and the District of Columbia showing locality records for the mud salamander, *Pseudotriton montanus*, in Maryland. Oval encompasses piedmont records.

5 February 1941; this may be erroneous), and the other is an uncatalogued specimen in the NHSM collection (mentioned by Reed, 1957) from Herring Run east of Hillen Road, Baltimore City, taken on 5 June 1954.

In his note on the rediscovery of the mud salamander in Pennsylvania after a hiatus of 143 years, McCoy (1992) misread and accepted a nearby "record" provided by Conant (1957) for this species in the Blue Ridge Physiographic Province of Frederick County, Maryland. Reed (1957) made the same error. Conant specifically stated that a specimen "said to have been taken in the Catoctin Recreational Area" was "unsubstantiated" and in need of verification. McCoy also overlooked the fact that Conant (1958, 1975) and Conant and Collins (1991; cited by McCoy) never plotted the locality, nor did Martof (1975). Furthermore, McCoy did not consult the work of anyone who has worked comprehensively with the distribution of the amphibians of Maryland (Cooper 1960, 1965; Harris 1969b, 1975). Neither of these workers, nor anyone else, has paid any attention to the site. McCoy also stated, erroneously, that Conant (1957) "noted the exclusively Coastal Plain distribution of the species in the northern part of its range." Conant actually wrote: "this salamander is almost limited to the Coastal Plain and the extreme outer edge of the Piedmont in the northern part of its range . . . . " Martof (1975), even though citing Fowler (1941), made a similar error, writing that *P. montanus* occurs "in the Coastal Plain only of Maryland ...." Pfingsten (1989) also made the same error, writing "*Pseudotriton montanus* inhabits . . . the Coastal Plain only of Maryland. . . ." As for details concerning the Frederick County "specimen," Conant (1957) mentioned that it was in the possession of C. J. Stine. I have been unable to determine with certainty the whereabouts of Stine's preserved herpetological collection, but it appears to have been discarded. Stine (personal communication, 1983) stated that it was given to the National Museum of Natural History "20–25 years ago," but R. I. Crombie has assured me (personal communication, 1985) that neither he nor G. R. Zug have any knowledge of it and that the museum never received it. Stine was unresponsive to recent (2007) phone calls concerning this matter.

In his review of the mud salamander's distribution on the Delmarva Peninsula, Heckscher (1995) committed several errors, both in fact and judgment. He stated that the source and specific locality data for Harris' (1975) Worcester County records were unknown (yet plotted them nonetheless), and relied, incomprehensibly, on someone else (A. W. Norden) to make that determination. One of these localities, with specific data, had been previously published (Harris, 1969a). Apparently no specimen exists for this site, but since the collector is almost certainly the same individual cited by Conant (1957) for a documented locality in northern Delaware, I find the record acceptable. However, Harris (personal communication) was unable to account for the other Worcester County site (vicinity of the confluence of Dividing Creek and the Pocomoke River). Heckscher (1995), again unfortunately relying on A. W. Norden, also misstated the locality data ("'17 miles northeast of the Nanticoke River'") for an uncited specimen (USNM 141323) from Wicomico County. The actual data are 17 miles NE Nanticoke, MD Route 349, collected on 30 March 1949, which places the site a few km W Salisbury.

In keeping with the modern disdain for systematic collections, rife in Maryland and common in much of the northeastern

quarter of the United States, Heckscher made the recommendation that this species not be collected and that documentation should be accomplished by photography. The former notion, in my opinion, is exactly backward and contrary to serious natural history, especially for this widespread and undercollected species, and the latter point unreasonable. Museum specimens are often hard enough to locate; slides would be far worse and are of little systematic value. Indeed, Heckscher stated that a photograph of one of his Delaware localities, with data no more specific than "eastern Sussex County," had been deposited in the Natural History Society of Maryland. This photograph cannot be located. Unfortunately and somewhat ironically, Heckscher's (1995) informant for two unsubstantiated sites for *Pseudotriton* in Worcester County did not document his discoveries in any manner, and Heckscher, without justification, tentatively assigned these reports to *P. montanus* and mapped them. These localities have no credibility and may well represent *P. ruber*; indeed, the University of Kansas has a *P. ruber* (KU 294326) from Mount Vernon, Somerset County, which is adjacent to and west of Worcester County.

Figure 1 presents an updated map of the distribution of *Pseudotriton montanus* in Maryland based on preserved specimens and three literature records that I consider reliable (Harris, 1969a; Lynch, ca. 1980; Smithberger and Swarth, 1993). D. C. Forester and C. R. V. Otto also found and photographed an individual at the Smithberger and Swarth site on 10 June 2003 (D. C. Forester, personal communication; photograph verified). Two reports in the literature have not been accepted. Reed (1957) listed a record in the Donald W. Linzey collection for Charles County (14.3 mi SE Doncaster). The locality is too imprecise to plot, and my attempts at determining the status of Linzey's material, the largest remaining Maryland herpetological collection in private hands, have been unsuccessful. A report from Calvert Cliffs State Park, Calvert County (Norden, 2005) has also been rejected. Norden claimed to have collected the species at this site, but no specimen exists. There is also the possibility of confusion with *P. ruber*, and his paper was so carelessly compiled that I find little in it to be reliable.

Acknowledgments

I thank the following for verifying identities or providing photographs: Neftali Camacho (LACM), Andrew C. Campbell (KU), Charles M. Dardia (CU), David A. Dickey (AMNH), J. Tomasz Giermakowski (MSB), Steve W. Gotte (USNM), David A. Kizirian (AMNH), James A. Poindexter II (USNM), Alan Resetar (FMNH), Stephen P. Rogers (CM), Gary W. Shugart (PSM) and Jack W. Sites, Jr. (BYU). I especially thank Don C. Forester (TSU) for extensive help with map construction and Joseph F. McSharry (NHSM) for the loan of specimens. Ronald I. Crombie (USNM) and Howard L. Snell (MSB) provided additional information or assistance.

Specimens Examined

Pseudotriton montanus: **Anne Arundel County**: BYU 23164-23166; NHSM 168, 600, 1660, 1667-1669, 1689, 4532; NHSM/HSH 77,147, 149, 209-212, 445; UF 41063-41064; USNM 101427-101428, 373109-373110. **Baltimore City**: NHSM 1209, 1222; Herring Run, E Hillen Road (NHSM uncatalogued). **Baltimore County**: CM 139401; NHSM 231, 795-797, 801; TSU 3623. **Calvert County**: CM 139402-139404, 139411, 143149; PSM 9298, TSU 983. **Caroline County**: CM 139415-139416; MSB 28099. **Charles County**: USNM 309375. **Prince George's County**: FMNH 208837; LACM 125095; NHSM 1660, 1781, 4752; TSU 1678; USNM 309554, 309555, 309556, 371241-371242, 533152. **Queen Anne's County**: CM 139414. **St. Mary's County**: near Chaptico (TSU uncatalogued); USNM 142809. **Wicomico County**: CM 21678, 22497, 38809; MSB 28104; USNM 141323. Additional Material Examined: AMNH 35930; FMNH 208838; NHSM 2472, 4743.

Pseudotriton ruber: **Somerset County**: KU 294326.

Undetermined (possible hybrids): **Calvert County**: TSU 330. **Prince George's County**: CU 5676. **St. Mary's County**: near Chaptico (TSU uncatalogued).

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What You Missed at the March Meeting

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As vice-president of your society one of my duties is to arrange for speakers each month. That's a daunting task for me. It's much easier to praise the quality of our speakers than to actually find qualified speakers, so I was really happy when two CHS grant recipients contacted me within days of each other shortly after I was elected to this position offering to speak about their research that your society helped fund. Grant recipients are already stamped as a cut above simply because they're grant recipients (see last month's article about the grant selection process), so I had no doubt that these talks would be interesting. After contacting them and researching them, I was sure that they both would be really interesting. February's speaker was Terri Wusterbarth, and if you read last month's article you know what I think of Dr. Wusterbarth (she's great!). Dan Warner was the speaker for March, and he certainly maintained our high standards for speakers.

Aaron Reedy on the left and Dan Warner on the right. Photograph by Dick Buchholz.

Dr. Warner graduated with a B.S. in animal ecology from Iowa State University in 1998, an M.S. in biology from the Virginia Polytechnic Institute and State University in 2001, and a Ph.D. in biology from the University of Sydney in 2007. He currently works as a postdoctoral research associate in the Department of Ecology, Evolution and Organismal Biology at the University of Iowa in the lab of Professor Fredric Janzen. His web site is http://www.public.iastate.edu/~dwarner/, and anyone reading that site cannot fail to be impressed not only by his past research but also with his current pursuits. Dr. Warner is a busy man whose research interests center around evolutionary ecology. He has been a member of the CHS for 15 years or so, and has received more than one grant from your society, but his CHS talk derived from his doctoral research. One of the papers published from that research has been particularly widely cited in the herpetological literature. The paper is "The Adaptive Significance of Temperature-Dependent Sex Determination in a Reptile". His talk was titled "Why Does Nest Temperature Determine Offspring Sex in Many Reptiles? A Case Study with an Australian Agamid Lizard." Some random items that make me like Dan more: he dedicated his Master's thesis to his parents; he invited his parents to his talk (they're very nice); he asked if he could bring another speaker along for an additional short talk (more about that later); I like the photographs he has on his web site; he graciously let me change his speaking date because I screwed up; he gets my sense of humor, or at least pretends to. For those few of you who for some reason may wish to gain my good opinion, please note that the last sentiment is a recurring theme. Just sayin'.

During our correspondence Dan asked if he might ask a long-time friend of his to give a short talk about the science being conducted in a high school classroom. I said yes, but in retrospect after my research about Aaron Reedy, I should have said no. Aaron should have been allocated a whole meeting to himself. Aaron is a high school biology teacher at Kelly High School on the southwest side of Chicago. He's been a recipient of the Golden Apple Award (prestigious) and grants from the Fund for Teachers and the National Science Foundation (also prestigious). He was asked to speak at a TED event (TED.com). His blog (http://wideworldscience.blogspot.com) chronicles some of his accomplishments. He offered a presentation about the "Kelly High School Lizard Project," a collaborative project with Dr. Warner that involved his high school science class in a real science experiment. Some random items I like about Aaron: he invited his parents to the meeting (they're very nice); his listed interests on his Blogger.com profile are "kayaking, surfing, climbing, hiking, sailing, running, photography, running, writing, science"; he opened his talk by outing Dr. Warner as a hard-core skate boarder; his TED talked contained the quote, "Today's teachers no longer need to be merely conduits of information. Teachers need to bring passion into the classroom"; I think he gets most of my sense of humor. It was a good night.

Dr. Warner began his talk by admitting that we probably all knew that females differ from males, but to reinforce that point we were treated to pictures of cardinals, elk, fish, insects, turtles and lizards that showed remarkable sexual dimorphism. He reminded us that differences also exist in physiology and behavior between the sexes.

There are two basic ways that the sex of an individual animal is established. With genetic sex determination (GSD) the sex of the embryo depends on the chromosomes donated by the father. In the XX / XY system the males inherit a Y chromosome from the father. All mammals and many reptiles, amphibians and fish have this system. In the ZZ / ZW system the females inherit the W chromosome from the mother. All birds and snakes and many other reptiles, amphibians and fish have this system. Both these genetic determination systems usually produce a 50/50 mix of males/females and therefore generally produce stable populations. It's widely accepted that environmental sex determination (ESD) produces unstable populations, with sex of the developing embryo affected by temperature, humidity, pH of water, and even photoperiods. One marine worm develops into a roughly 8-inch-long female if the larva settles on the ocean floor but

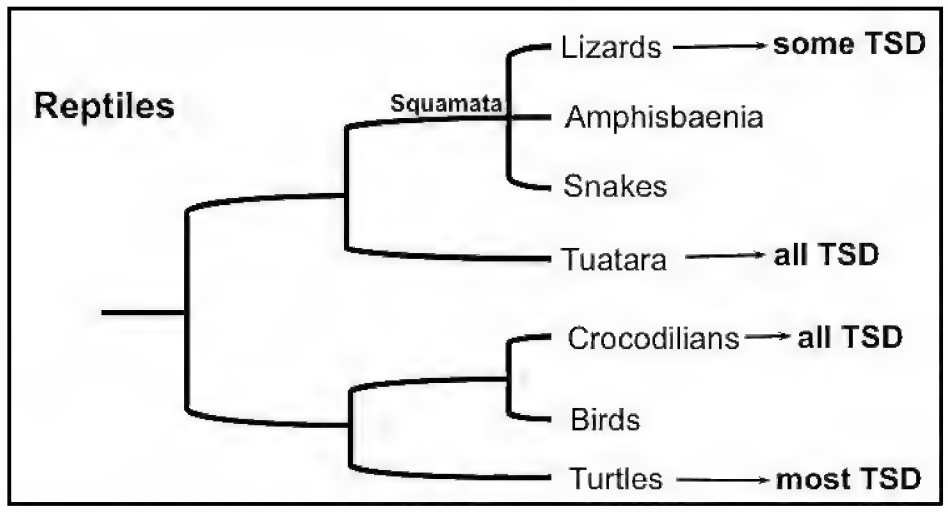


Diagram of the living groups of reptiles (including birds), showing which taxa exhibit temperature-dependent sex determination.

becomes a tiny male if the larva settles on a female, where it will remain the rest of its life. Many crustaceans, fish, reptiles and even some plants have ESD. Dan wanted to study a specific type of ESD, temperature-dependent sex determination (TSD).

The sex of all crocodilians and tuataras, most turtles, and some lizards is determined by the temperature the eggs experience. In 1977 Eric Charnov and Jim Bull hypothesized that TSD has not been replaced by an alternate sexual determination mechanism because TSD confers a survival advantage to the sex produced at a given temperature. While this hypothesis makes sense, it is extremely difficult to prove experimentally. Most of the animals that exhibit TSD reach sexual maturity after several years and are long-lived (to test survival advantage in such an animal could be a long-term project indeed). And if sex of the animal is determined by temperature, how do you test a male or female that was not hatched in the correct temperature range? Despite such obstacles Dan Warner decided to take on the challenge. The creativity involved in the process is an example of what makes science so very often very exciting.

Dan focused on jacky dragons (*Amphibolurus muricatus*). They are Australian agamid lizards that live about 3½ years and reach sexual maturity in about one year. They lay 6–8 eggs in a clutch, can produce multiple clutches in a season, and they have TSD. Females are produced from a temperature range of 24°C to 32°C; males are only produced in the mid-range temperatures of about 27°C to 29°C. One of Dan's first tasks was to measure nest temperatures to confirm the effect of temperature on sex ratios in the field. He showed us pictures of gravid jacky dragons wearing his custom-made jacky jackets outfitted with radio tracking devices that allowed him to check the females' locations every two hours as they approached nesting time. A photo of a nest in which eggs had been laid gave us a clear idea of why he had to carefully and frequently track the gravid females. Without markers the nests would have been nearly impossible for Dan to find, but not for lace monitors (*Varanus varius*). Dan had to screen his nests from the monitors

Female jacky dragon (*Amphibolurus muricatus*) wearing Dr. Warner's custom jacky jacket.

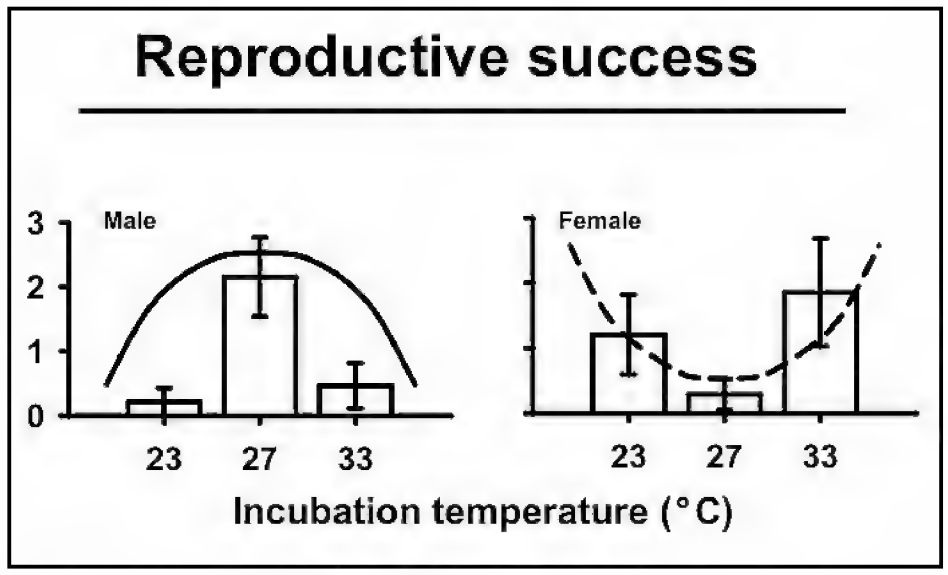
Hatchling jacky dragons. Awwww.

and occasionally would track a monitor for a while to retrieve the transmitter strapped to the female jacky dragon that had been the monitor's meal. He said that he got nearly all of them back and they worked fine.

After finding and measuring 44 nests, Dan ran the data and found that the mean nest temperatures had no effect on sex ratios, which was a bit disconcerting because lab studies had shown definite TSD and sex ratios should be determined by the nest temperatures. After looking at the data, Dan thought that more than just mean nest temperatures might be considered. Taking into account the fluctuations (mean × variance interaction) in nest temperatures from about 20°C to nearly 40°C, the effects on sex ratios were clearly demonstrated. Dan mentioned that our treatment of TSD is oversimplified.

The next challenge was getting both sexes at all temperatures and he handled this by using an aromatase inhibitor and causing eggs that would result in females (based on incubation temperature) to produce males. After collecting gravid females and hatching treated and untreated eggs in varying temperatures, he released the off spring into cleverly designed large outdoor enclosures. Then he tested for fitness of the males, first looking at territorial behaviors. Some interesting pictures and a quick film gave us an idea of the displays and combat used by male jacky dragons; they were more aggressive than I expected and really rapid. The results? Incubation temperature had absolutely no statistically relevant effect on male territorial behaviors. The frustrations of research were once again demonstrated.

Undaunted, Dan collected data on individual males' reproductive success by genotyping all adults and all offspring of second-generation eggs and doing paternity analyses. To recap the expected results according to the Charnov-Bull model, males and females incubated at the temperatures that naturally determine the sex of the offspring should produce more offspring than those



The Holy Grail of Dr. Warner's Ph.D. efforts.

lizards that were incubated at a temperature that would not produce that sex in the wild. With a hint of irony as he displayed an unadorned graph showing results that fit perfectly with the theoretical predictions, Dan said, "And this is the holy grail of my Ph.D. work." Dan ended with a quote from Stuart West's 2009 book *Sex Allocation*, " . . . over 30 years of research on TSD in reptiles by 'serious, thoughtful biologists' has failed to provide clear support for the differential model." Problem solved. Dan is now pursuing the answers to the many other questions raised by his research. I suspect that we will see many more of his papers referenced.

Aaron Reedy then took over to talk about the experiment he did with his high school students at Kelly High School on the southwest side of Chicago. Accompanied by pictures of regal-looking brown anoles (*Anolis sagrei*), an upside-down ornate box turtle (*Terrapene ornata*) being weighed, and a close-up common snapping turtle (*Chelydra serpentina*), he described his time spent at "turtle camp" doing research with Dr. Warner. Working with high school students involved in the Iowa State University project, Aaron noticed the enthusiasm and dedication they brought to doing real research in biology. With help from Dr. Warner and others, he developed a plan that he could use in his classroom to involve students in the joys and setbacks of scientific investigation.

He chose the brown anole because as a vertebrate it has a bit more appeal than a flatworm yet is still relatively easy to acquire, breed and care for, and because Dan Warner was already doing some research with the species. To do real science you need a hypothesis, and Aaron decide to investigate if female anoles choose nesting sites that are beneficial to the survival of their offspring. Using much creativity he and Dr. Warner decided to use twenty 10-gallon aquariums each containing ten pots of soil. Pots would have five moisture levels ranging from 0% to 75% (the latter as saturated as they could maintain without the soil being soupy). Half would contain only soil while the other half would also include plants. Aaron accompanied Dr. Warner to Florida where they captured breeding stock and he learned more about the natural history of the animals. Aaron skillfully led us through the difficult but often hilarious process of setting up a classroom to handle multiple aquariums full of multiple lizards. I won't try to describe of trials of seemingly simple tasks such as removing all moisture from soil, but using the art department's clay kiln turned out not to be a successful method. The final set up looked as though it would put many college-level labs to shame.

Into each aquarium went one male brown anole and three females and the kids got to work. Over the course of the school year they cleaned and cared for the lizards and each week they emptied the pots of soil searching for eggs. Finding an egg was an occasion for celebration and recording, and then the eggs were randomly assigned different moisture levels in which to incubate. The kids were already involved, but the cuteness of the first hatchlings had them totally hooked.

To everyone's surprise, about 60% of the females chose to deposit their eggs in 75% soil moisture, while about 35% chose 50% soil moisture. Plants did not seem to matter. After incubation, all of the eggs incubated at 75% were alive at three weeks of age and a significantly fewer number of those incubated at lesser percentages of moisture survived that long. Seems as though they had hard data supporting their hypothesis. A paper will be submitted.

Aaron made the point that his students were exploring questions that had no previous answer. It was thrilling for them to know facts that no one else knew. They experienced the triumphs and set backs that any researcher experiences, and became so enamored with the adventure that they branched into other experiments exploring other aspects of brown anoles. Students from outside his class would come in on their own time to help. It was indeed fulfilling his idea of what a teacher needs to be, no longer merely a conduit of information, but a conveyor of passion. I was sorry that Aaron didn't have more time to elaborate on the nest selection experiment and expand on the other experiments the students pursued. The next time Aaron Reedy talks to the CHS, he is welcome to come with Dan Warner, but Aaron will be speaking the full hour. We can't let these guys share again. They just have too much cool stuff to talk about.

Herpetology 2011

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

HERP TRADE IN THE UK

B. Tapley et al. [2011, The Herpetological Journal 21(1):27-34] compared the trade in reptiles and amphibians in the United Kingdom between 1992-3 and 2004-5. In particular, the impacts of captive breeding and color and pattern morphs on price structures were examined. The number of amphibian and reptile species in the trade more than doubled over this period, and less than a third of the species traded were common to both trading periods. More traded species were listed by CITES in 1992-3 than in 2004-5. Taking into account inflation, the study showed that the price of all groups of reptiles and amphibians recorded increased over the ten-year period, and that some snake species had done so dramatically when color and pattern morphs were considered. The price change of chelonians was probably the result of responses to changes in various trade regulations. Price increases for amphibians seemed to represent their increased popularity, coupled with the overhead costs of captive breeding on a commercial scale being transferred to the hobbyist. The increased popularity of captive-bred color and pattern morphs could alleviate pressure on wild stocks. On the other hand, as such animals are predominantly being produced outside their countries of origin, no benefits accrue to local people and trade could undermine sustainable use programs for wild animals.

WATER VELOCITY TOLERANCE IN TADPOLES

S. J. Kupferberg et al. [2011, Copeia (1):141-152] explored the effects of large magnitude flow fluctuations in rivers with dams, commonly referred to as pulsed flows, on tadpoles of the lotic-breeding foothill yellow-legged frog, *Rana boylii*. They quantified the velocity conditions in habitats occupied by tadpoles and then conducted experiments to assess the tolerance to values at the upper limit of, and outside, the natural range. The velocities observed during pulsed flows were mimicked in laboratory flumes and field enclosures. In all experimental venues, the behavioral response of tadpoles was to seek refuge in the channel substrate when velocity increased. In a large laboratory flume, tadpoles moved freely at low water velocities (0–2 cm/s) and then sheltered among rocks when velocity increased. In a smaller scale laboratory flume, the median critical velocity was 20.1 cm/s. Critical velocity varied inversely with tadpole size, developmental stage, and proportion of time spent swimming. Velocities as low as 10 cm/s caused tadpoles approaching metamorphosis to be displaced. In field mesocosm experiments, tadpoles exposed to repeated sub-critical velocity stress (5–10 cm/s) grew significantly less and experienced greater predation than tadpoles reared at ambient velocities. Responses to velocity manipulations were consistent among tadpoles from geographically distinct populations representing the three identified clades within *R. boylii*. The velocities associated with negative effects in these trials are less than typical velocity increases in near shore habitats when recreational flows for white water boating or peaking releases for hydroelectric power generation occur.

MASSASAUGA SPATIAL ECOLOGY

B. A. DeGregorio et al. [2011, Herpetologica 67(1):71-79] investigated the spatial ecology of the eastern massasauga (*Sistrurus c. catenatus*) at a study site unique in that it was near the northern extent of the species' geographic range and had a sandy substrate and extensive mixed coniferous forest. Forty-six individuals were radiotracked for at least one complete season between 2002 and 2004 or 2006 and 2007. Males had larger home ranges and core areas, range lengths, and movement rates than nongravid females, which in turn had larger movement parameters than those of gravid females. Movement rates and distances were not constant throughout the activity season, with males making greater movements as the activity season progressed and gravid females making the longest movements immediately following parturition. Total area used during the activity season was intermediate relative to that used by massasaugas at other sites, with minimum convex polygons around outermost observations during the active season averaging 16.7 ha. Movement indices at this site were much larger than reported indices from study sites in the central or southern portions of the massasauga's geographic range and more similar to those from Ontario and New York. The trend for increased movements at northern latitudes may have implications for managers attempting to provide sufficient habitat for viable populations and minimize interactions between snakes and roads or other anthropogenic disturbances.

MANABÍ HOGNOSE PITVIPERS

J. H. Valencia et al. [2011, Herpetozoa 23(3/4):31-43] note that *Porthidium arcosae* (Schätti and Kramer, 1993) is a terrestrial, small-sized (ca. 720 mm total length), rare and little studied pitviper endemic to Ecuador, occurring in a variety ofdry xeric forests, in the province of Manabí. Specimens preserved in collections and observations of snakes in captive conditions yielded new information about its natural history and potential distribution. The present update of knowledge on the geographical and altitudinal range includes 12 localities in the province of Manabí. An ecological niche model predicted additional records along the coast of the provinces of Manabí (as far to the north as San Vicente, about 50 km beyond the known territory) and Santa Elena. Sexual dimorphism was not significant relative to the length of body and tail. However, there was a significant difference in the length-to-width ratio of the head, which is comparatively wider in females. Courtship and mating is briefly described from three captive groups. *Porthidium arcosae* feeds on lizards in its juvenile phase and rodents as an adult. Four other pitviper species are sympatric with *P. arcosae*: *Bothrops asper*, *Bothrops punctatus*, *Bothriechis schlegelii* and *Porthidium nasutum*. A case of envenomation of a 29-year-old man from a bite by *P. arcosae* is reported. A conservation status assessment indicates that *P. arcosae* falls into the IUCN category Endangered (EN).

NORTHERN MAP TURTLES IN CANADA

A. M. Bennett et al. [2010, Chelonian Conservation and Biology 9(2):185-195] note that the construction of locks and dams in rivers may present barriers to movement for aquatic organisms and effectively fragment otherwise continuous populations. The authors examined the spatial ecology and population genetics of northern map turtles (*Graptemys geographica*) in the Trent-Severn Waterway (TSW), Ontario, Canada. They hypothesized that the locks and dams on the TSW are fragmenting map turtle habitats and creating barriers to movement, and predicted that turtles from fragmented habitats have significantly reduced home range sizes and daily movements compared to turtles from unfragmented habitats, and that populations on either side of a lock and dam would be genetically distinct. Home ranges and average daily movements were smaller for turtles from fragmented habitats compared with continuous habitats, indicating that locks and dams are restricting mobility. However, populations in fragmented habitats showed none of the predicted genetic consequences of fragmentation (e.g., reduced heterozygosity and allelic richness, differentiation across a barrier). Genetic data may be reflecting historic population structure because only a few turtle generations have passed since the construction of the locks and dams about 100 years ago. Additionally, the genetic data may not be sufficiently robust to detect differentiation at this relatively small geographic scale. The study highlights the conservation importance of examining multiple facets of a single potential threat, especially for long-lived species that may show differences in short- and long-term effects of fragmentation.

MUD TURTLES IN AN EXTREME HABITAT

F. R. Hensley et al. [2010, Herpetological Monographs 24: 174-193] studied the population biology of Sonora mud turtles (*Kinosternon sonoriense*) for 10 yr in an extremely hot and dry desert stream habitat in central Arizona. Adults made up 34.4% of the population. Modeling with Program MARK indicated that both age class (adult vs. juvenile-hatchling) and season contributed significantly to the probability of capture. The presence of exotic crayfish (*Orconectes virilis*) and age class were significant contributors to turtle survival, supporting the hypothesis that exotic crayfish are important predators on hatchlings. Population density estimates indicated low density over the range of water availability. Both adults and juveniles made long-distance movements along the dry stream bed between pools of water. Males and females were both likely to make long-distance movements and were sometimes absent from the study site for years at a time. In addition to terrestrial estivation in fore-summer drought, turtles apparently hibernated on land in winter when standing water was available. Growth fit a von Bertalanffy model very well. This study provides the first report of growth rates for hatchling *K. sonoriense*. Growth rates estimated from shell annuli were consistent with similar estimates for older turtles in other studies. Measured growth rates, however, were much higher than annuli-based estimates. In contrast to other populations, it was found that hatchlings and juveniles in this study added 1–3 plastron annuli each year, making age estimation from annuli difficult. Understanding relationships between habitat use, invasive predators, and demographics is essential for effective management of low-density populations.

MONA ISLAND IGUANA SPATIAL ECOLOGY

N. Pérez-Buitrago et al. [2010, Herpetological Monographs 24: 86-110] note that the endangered iguana *Cyclura cornuta stejnegeri* is endemic to Mona Island, Puerto Rico. Factors accounting for its protected status include low adult densities and relatively low abundance of juveniles. The authors studied the spatial ecology, territoriality, and philopatric behavior along a gradient of human-disturbed areas to help understand its unusual demography. The minimum convex polygon method was used to estimate the home range of radiomarked iguanas, the degree of inter- and intrasex home-range overlap, and the temporal patterns of space use by 42 iguanas (19 males and 23 females, including 4 juvenile individuals) during the nonbreeding (October–November) and mating season (June) at three Mona Island localities with different levels of human disturbance. Juvenile iguanas had larger home ranges and moved across the home ranges of several adults. Adult males had larger home ranges than females and no significant temporal differences in size or pattern of usage (Cole index) were detected between the study periods. Females, despite reducing their home-range size during the mating season, changed the usage patterns, resulting in increased interactions with neighboring males. Home-range overlap was minimal between males, followed by female–female overlap and maximal between males and females. These results suggest that Mona Island iguanas are highly territorial throughout the year; particularly males in the mid- and undisturbed areas where almost all home-range areas appear to be equivalent to the defended territory. In the most disturbed area, where supplemental feeding by humans exists, home ranges are smaller and there is larger intersex home-range overlap. Previously, the low density of the population was attributed to lack of recruitment into adult stages due to predation of juveniles by nonnative mammals. However, the high levels of territoriality documented in this study may be an additional factor explaining the low densities exhibited by this population. The data suggest that the three study sites may be at or close to carrying capacities for males, because there appear to be no vacant areas for additional males. Furthermore, the large and highly overlapping home ranges exhibited by four juvenile iguanas suggest that they are or will become floaters in search of unoccupied space.

DAY GECKOS AND BAOBABS

C. Cornu and C. J. Raxworthy [2010, The Herpetological Journal 20(4):281-284] note that Standing's day gecko, *Phelsuma standingi*, is one of the largest and yet most poorly studied geckos in Madagascar. The authors report the discovery of a substantial northern range extension and document a previously unrecognized association between this gecko and baobab trees in southwest Madagascar. At three survey sites *P. standingi* was found associated with three baobabs: *Adansonia grandidieri* in northwest Morombe, *A. rubrostipa* at Ranobe and *A. za* at Zombitse Reserve. Although *P. standingi* is not an obligate baobab tree specialist, these massive trees appear to offer secure refuge and climbing surfaces, and baobabs are the main microhabitats occupied by these large day geckos. This unrecognized gecko–baobab association might partly explain why so few field observations have been made previously for *P. standingi*.

DESERT MASSASAUGA MOVEMENT PATTERNS

A. R. Wastell and S. P. Mackessy [2011, Copeia (1):29-37] note that the massasauga rattlesnake (*Sistrurus catenatus*) occurs from extreme southeastern Canada to northern Mexico, and most populations are highly threatened due to habitat loss and fragmentation. Although their range is reduced from historical levels, they may be locally abundant in appropriate habitat. We studied movement patterns, home range and core activity centers, habitat use, and prey abundance in a robust population of desert massasauga rattlesnakes (*S. c. edwardsii*) in southeastern Colorado by radiotracking 36 snakes over four active seasons (May–October). In the spring, snakes made long-distance directed movements (mean = 1.89 km) from the hibernacula (shortgrass, compacted clay soils) to summer foraging areas (mixed-grass/sand sagebrush, sandhills). Summer activity was characterized by short distance non-directional movements, and snakes were most often observed at the base of sand sagebrush (*Artemisia filifolia*). Home ranges and core activity centers were significantly larger for males than for females, but daily movements, total distance moved, and range length did not differ significantly between sexes. Prey base surveys indicated a significantly higher abundance of both rodents and lizards in summer foraging grounds than at hibernation sites. Snakes returned to the hibernaculum area in October and appeared to hibernate individually in rodent burrows. Migration patterns exhibited by *S. c. edwardsii* are likely resource driven, with the migratory movements observed in the spring resulting in utilization of summer foraging habitat with more abundant prey. Conversely, hibernacula with greater thermal and structural stability in the shortgrass habitat (perhaps due to the compacted clay soils versus loose sandy soils) favor migratory return for torpor in the fall. At present, the main populations in Colorado occur far from developing regions in the state, but due to habitat loss and fragmentation resulting from projected agricultural expansion and urbanization, these populations may be threatened in the future.

INTRODUCED LIZARD POPULATIONS

S. R. C. Mole [2010, The Herpetological Bulletin (114):24-29] reports that introduced populations of *Lacerta bilineata* and *Podarcis muralis* were discovered on Boscombe Cliffs, Dorset, UK, in 2002. Since then both species have been breeding successfully. This investigation plotted their territory in 2007 and compared their population trends with that of the native *Zootoca vivipara*. Fifteen survey visits were undertaken between April and September 2007 during which time observations were made of 214 non-native and 44 native lizards. The two introduced species dominated the central area of the site with the native species found in substantial numbers only on the periphery. Comparison with earlier data shows that the relative abundance of non-native species has increased; between 2002 and 2007 *P. muralis* increased by 40% and *L. bilineata* by 36%; compared with *Z. vivipara*, which declined by 75%. Sufficient habitat favorable to the introduced species means that there is the potential for unimpeded range expansion along the cliffs, which raises concern for a sand lizard *Lacerta agilis* population to the west of this site. Eradication of the non-native species may be impractical because they occur on a relatively inaccessible cliff face.

SNAKE SIZE IN AN INSULAR POPULATION

K. Tanaka [2011, Herpetologica 67(1):46-57] note that difference in growth pattern is one of the proximate causes of geographic variation in body size. Such a difference in growth pattern could be explained by two extremes such as genetically determined outcome and phenotypic plasticity or by a combination of these. The Japanese four-lined snake (*Elaphe quadrivirgata*) on Yakushima Island, Japan, has small body size compared with snakes on the main islands. To examine whether the dwarfism of Yakushima snakes is a consequence of genetic modification or a direct phenotypic response to immediate environmental conditions, *E. quadrivirgata* from Yakushima and a main island (Shiga Prefecture in Honshu Island), were reared from hatching in a laboratory environment. Data of field surveys were used to examine feeding habits and growth in the wild. Free-ranging snakes on Yakushima had significantly smaller body size and lower growth rate than those in Shiga. Yakushima snakes consumed almost exclusively lizards, whereas frogs were the main prey for Shiga snakes. The proportion of snakes that contained food in their stomach was lower in Yakushima than in Shiga. Available information suggests that the dwarfism of Yakushima snakes cannot be explained by lower survivorship. At hatching, Yakushima snakes of both sexes were larger than Shiga snakes. However, Yakushima and Shiga snakes reached similar body size after approximately 1 year. Captive-reared snakes from the insular dwarf population can reach comparable size to those from the main island, indicating that the growth rate, and hence body size, of *E. quadrivirgata* is obviously highly plastic. Based on these results, the author considers that the dwarfism of Yakushima snakes is attributable to a direct phenotypic response, presumably to food limitation, rather than to microevolutionary changes.

LARVAL AGGRESSION IN SALAMANDERS

C. L. Mott and T. J. Maret [2011, Copeia (1):9-17] observed agonistic behavior among larval *Ambystoma opacum*, *A. jeffersonianum*, and *A. maculatum* in intra- and interspecific pairwise comparisons to determine if sympatric species exhibit unique behavioral responses to the presence of con- or heterospecific larvae, if they respond similarly to variation in competitor size, and if species identity is a reliable predictor of predation and cannibalism versus strictly nonlethal competitive interactions as an outcome of larval aggression. Each species exhibited a unique suite of behavioral responses associated with species and competitor size. *Ambystoma opacum* displayed high levels of aggression, most often towards conspecifics, but these behaviors rarely resulted in predation. Conversely, *A. jeffersonianum* displayed aggression frequently and often consumed both con- and heterospecific larvae. Furthermore, this species did not reduce aggression even in the presence of larger larvae. *Ambystoma maculatum* displayed relatively low levels of aggression under most circumstances. The authors conclude that these characteristic responses are associated with species-specific morphological and developmental features and the temporally staggered pattern in which these species appear in ponds. These observations highlight the importance of these traits to behavioral divergence among ecologically similar taxa occurring in sympatry.

SCULPINS AND HELLBENDERS

B. G. Gall and A. Mathis [2011, Copeia (1):5-8] exposed two size classes of banded sculpins, *Cottus carolinae*, to alarm cue secretions from an adult hellbender (*Cryptobranchus alleganiensis*) or to a blank control and examined foraging responses. Banded sculpins exhibited size-dependent responses, with small individuals exhibiting avoidance behavior and large individuals exhibiting increased foraging behavior. These data suggest that banded sculpins undergo an ontogenetic shift in response to hellbender alarm cues that corresponds to changes in predation risk and foraging profitability.

MIMICRY INVOLVING AN INSECT AND A TADPOLE

M. A. P. Horta et al. [2010, The Herpetological Bulletin (114): 4-7] report on the occurrence of similar aposematic color pattern between two phylogenetically unrelated aquatic organisms, an insect and a tadpole. The limnocorid heteropteran *Limnocoris porphyrus* and tadpoles of the hylid frog *Scinax machadoi* are found in sympatry and syntopy in several streams in the Serra do Cipó, a pristine area located in the Espinhaço Range, Minas Gerais state, southeastern Brazil. The similarity between these two organisms makes it difficult to distinguish them at first sight. The authors suggest that they are possibly part of a process of Müllerian mimicry, but recognize that an evaluation of palatability and population size estimates are needed to verify this suggestion.

GROWTH RATES OF AFRICAN SPURRED TORTOISES

J. Ritz et al. [2010, The Herpetological Journal 20(3):213-216] note that in captivity, tortoises often grow faster than their conspecifics in the wild. This study documents growth (measured as change in body mass) in three individual *Geochelone sulcata* over an exceptionally long period of nearly 18 years and compares this growth with growth data (measured as change in carapace length) from the literature on free-ranging animals. Body lengths almost reached a plateau in the animals due to the long observation period. After transformation of body length to body mass for data from wild animals, logistic growth curves were successfully fitted to all data. The resulting functions yielded a 1.4–2.6 times higher intrinsic growth rate in captive than in wild individuals. The logistic growth model estimated the inflexion point of the growth curve at 6–9 years for the captive animals. This coincided with age at sexual maturity, respectively observations of first egg-laying of a female and the masturbation of a male. The inflection point of the growth curve for free-ranging individuals was estimated at 15 years. Raising tortoises on intensive feeding regimes in captivity may considerably shorten generation times during the breeding stage of restocking programs, and slow-growing animals are more likely to thrive after release into the wild. Investigations on the health of offspring from fast-growing parents are lacking.

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REPTI SUN

Unofficial Minutes of the CHS Board Meeting, March 17, 2011

The meeting was called to order at 7:48 P.M. at the Grove in Glenview. Board members John Archer and Jenny Vollman were absent.

Officers' Reports

Recording Secretary: Cindy Rampacek read the minutes of the February 16 board meeting and they were accepted as read

Treasurer: Andy Malawy presented the financial report. It was discussed and accepted. New voicemail charges roughly double our cost. We are going to look into options such as perhaps switching to a cell phone.

Membership Secretary: Mike Dloogatch read a list of memberships due to expire. Lots of new members plus a number of late renewals will result in a net increase this month.

Sergeant-at-arms: Greg Brim reported that there were 33 people at the February meeting; he also reported that there were 53 at the January meeting.

Corresponding Secretary: Deb Krohn will find out from AT&T what's going on with our messaging system.

Publications Secretary: Aaron LaForge got the new board members set up with their chicagoherp.org email addresses. He asked anyone with problems to let him know. Aaron has also been in touch with Chris Lechowicz about our Herps of Illinois web page.

Committee Reports

Shows: Jason and Aaron hope to get a calendar online.
- Notebaert, First full weekend of each month
- Chicagoland Family Pet Expo, March 18–20.

Grants: Grant awards were listed in the February *Bulletin*. John Archer wrote a description of the grant committee's meeting for the March *Bulletin*.

Old Business

Service awards: Some of the awards were handed out at the February meeting. The rest will be given out at the March meeting.

Magnets: The magnets have been ordered and will be available for sale at ReptileFest

Spring picnic: We are looking May 21 for the date of a picnic at the Wildlife Discovery Center in Lake Forest. We will have confirmation and make an announcement at the March meeting.

ReptileFest: We will have an ATM on site, so we will not need to take credit cards at the door. Torre's will not be providing the food this year. Linda offered to look into other options. Andy Sagan is going to work on organizing a crew of volunteers to help wherever needed. Greg Brim and Steve Sullivan will work with any organized groups of scouts who attend. Deb Krohn is looking for additional speakers. Petsmart wants several vendor tables. Jason will negotiate with them. This will be Rick Hoppenrath's last year running 'Fest. We are looking into bringing back the palm trees. They were requested by the university and they are willing to pay a portion of the cost.

Round Table

Mike got an email from a member who has a collection of *Bulletin*s back to the 90s; he plans to digitize them and make them available to the CHS.

Nancy Kloskowski works at Jo-Ann Fabrics. When she got to work one day, there was a large ReptileFest flyer on the wall that she had not put up. She was shocked and excited.

Dick reported that the Notebaert had unusually large crowds the first weekend of this month because of an arrangement with Groupon.

The All-animal Show has invited us to promote ReptileFest at their show.

Bob Bavirsha mentioned that all of the nature centers who were at the hunting and fishing show would like flyers or cards for 'Fest.

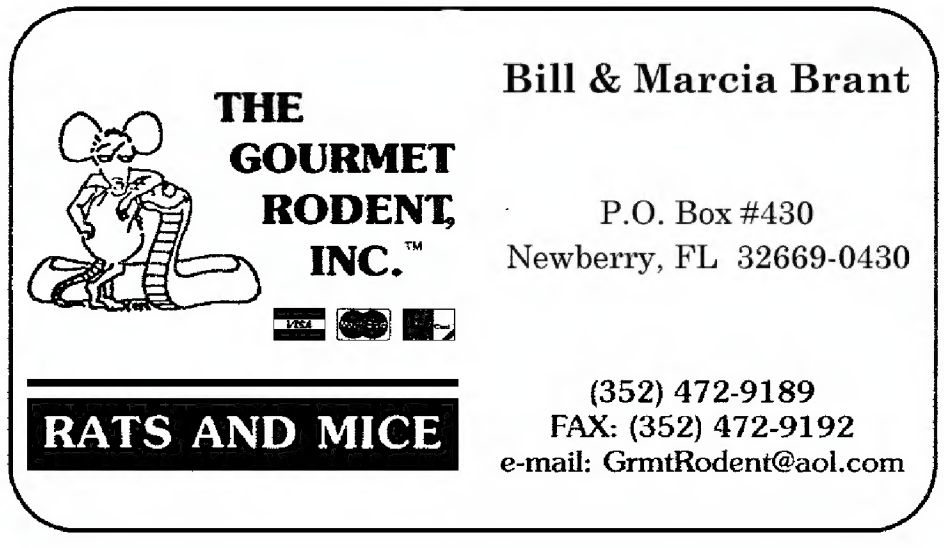
Andy Malawy mentioned that there are only three doors into the main area at 'Fest, and perhaps we can move the large groups at the back door. A lively discussion ensued.

Cindy mentioned that her "Women in the Reptile Community" talk was accepted at IHS.

Mike Dloogatch mentioned that the governor has signed a law that all online purchases by Illinois residents are subject to taxes if the seller has a business arrangement with an Illinois company. Therefore, we believe our arrangement with Amazon may be ended by them.

The meeting was adjourned at 9:30 P.M.

Respectfully submitted by recording secretary Cindy Rampacek



Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: from **The Mouse Factory**, producing superior quality, frozen feeder mice and rats. Our mice and rats are vacuum-packed to greatly extend freezer life by reducing freezer burning and preserving vitamin and nutrient content. We feed our colony a nutrtionally balanced diet of rodent chow, formulated especially for us, and four types of natural whole grains and seeds. For a complete price list please visit our web site, www.themousefactory.com. We accept all major credit cards, PayPal or money orders. Call us **toll-free** (800) 720-0076 or send us an e-mail at info@themousefactory.com. Write us at PO Box 85, Alpine TX 79831.

For sale: **high quality frozen feeders**. Over a decade of production and supply. Seven sizes of mice availabe: small newborn pinks up to jumbo adults. Prices start at $25 per 100. Feeders are separate in the resealable bag, not frozen together. Low shipping rates. Free price list. Kelly Haller, 4236 SE 25th Street, Topeka KS 66605, (913) 234-3358 evenings and weekends.

For sale: Rats—live or frozen. I breed rats for my collection of boas so only top quality lab chow and care will do, I'm now offering surplus animals for sale. Located in far south suburbs of Chicago. Only orders of 20 or more please, no large rats will be available. For current availability and prices, please e-mail Steve at smuys@sbcglobal.net.

For sale: New book, 2011, just released: *Matamatas; The Natural History, Captive Care, and Breeding of* Chelus fimbriatus by David Fogel. The most comprehensive volume on this fascinating turtle. Well researched, 64 pages, with 49 literature citations. Well illustrated with 58 full-color photographs of captive specimens, their enclosures and filtration set-ups, wild specimens, and habitat. This book in the Turtles of the World Series will present readers with a look at the life of this amazing turtle in nature and in captivity. Enclosure designs, filtration details, and specific captive care requirements are included. Signed or personally inscribed and signed (provide instructions with order) copies are available from the author for $12.99 each plus shipping ($3.00 for the first copy & $1.00 each additional copy to US addresses, and $7.00 each for international destinations). Send check or money order to: David Fogel, 1750 Haines Road, Orwell, OH 44076. Payment through PayPal (including credit card payments) can also be accepted at herphouse1@aol.com. Please send any inquiries to this e-mail address.

For sale: 2009 & 2010 juvenile rosy boas from long-term captive-born adults. Tom Zaremba, Camp Douglas, WI. Phone (618) 427-3864 for pick-up or possible delivery to Chicago area. No email.

For sale: Trophy quality jungle carpet, diamond-jungle, and jaguar carpet pythons. Website: moreliatrophyclub.com E-mail: junglejohn@tds.net.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney 305 664-2881

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Wildlife Tour—Australia: October 21–November 7, 2011. Lamington and Kakadu National Parks and the Atherton Tablelands of northeast Queensland. Visit subtropical and tropical rainforests and archetypical Australian outback. On last year's tour, we saw many herps including both freshwater and estuarine crocodiles, saw-shelled turtles, Boyd's forest and eastern water dragons, land mullet, lace monitor, frill-necked lizard, carpet python, common tree snake and taipan. Although the focus is on birds on this trip, we will see much other wildlife, too. Mammals seen on the last tour included ten kinds of kangaroos and their kin, flying foxes, dingo, and platypus. And red-tailed black cockatoos, a golden bowerbird on his bower, wedge-tailed eagles, Gouldian finches, hooded parrots, laughing and blue-winged kookaburras, emus and a cassowary, among many other birds. We stay in comfortable accommodations and relish tasty meals. Maximum group size is 14 with 5 places currently available. If you enjoy visiting wild places with knowledgeable local naturalist guides in the company of fellow travelers who appreciate nature as you do, then consider this tour to spectacular settings. The land cost is $5495 per person double occupancy. For an itinerary and more information, please contact Bill Turner at (303) 795-5128 or e-mail: toursbyturner@aol.com.

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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, April 27, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. If you watched the *Nature* episode "Invasion of the Giant Pythons" on PBS you'll have seen **Mike Rochford** flying over and wading through the swamps of Florida pursuing Burmese pythons, but he's also done work on both the American alligator and the American crocodile. He's a graduate of Kansas State University and did herp surveys in Colorado and radio tracking of massasauga rattlesnakes in Missouri before going to work for the University of Florida under the direction of Dr. Frank Mazzotti and Dr. Kenneth G. Rice. He left Florida at the beginning of this year, but he's going to tell us of his adventures during his nearly five years catching alligators, crocodiles, and 16-foot Burmese pythons.

At the May 25 meeting **Cindy Steinle** will speak about "Women in the Reptile Community." Cindy Steinle is president of Wisconsin-based Small Scale Reptile Rescue and is involved in pit bull rehabilitation. She is a site coordinator for kingsnake.com. She has served on the board of the Chicago Herpetological Society for several years. She serves in education outreach for the International Reptile Conservation Foundation. All of these activities mean she is well known throughout the reptile community and frequently travels around the country for her various roles.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., May 13, at the Wildlife Discovery Center at Elawa Farms, 1401 Middlefork Drive, Lake Forest, Illinois.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the CTC website: http://www.geocities.com/~chicagoturtle.

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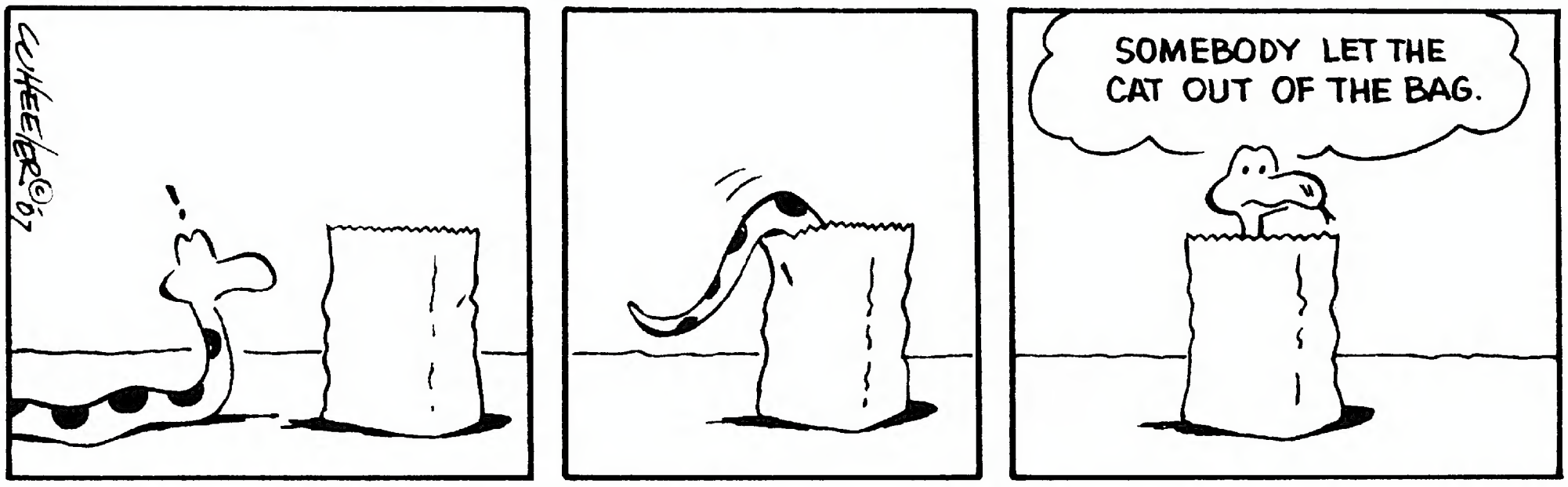

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